REMARKS

The Examiner rejected claim 1, 26 and 29 under 35 USC 102(b) as being anticipated by Sutherland (US Patent Application Publication 2001/0046910). The Examiner also rejected claims 2-20, 24, 25, 27 and 28 under 35 USC 103(a) as being unpatentable over Sutherland. The Examiner also rejected claims 21 and 23 under 35 USC 103(a) as being unpatentable over Sutherland in view of Kunisaki et al. (US patent 6,117,029). The Examiner also rejected claim 22 under 35 USC 103(a) as being unpatentable over Sutherland in view of Merola (US patent 3,479,030).

Applicants' invention is a player hockey stick shaft which is a hollow tube made of titanium or a titanium alloy in the form of a one-piece wall with the lower end being adapted to receive a player hockey stick blade. In particular, the titanium or titanium alloy has an elastic modulus greater than 13 million psi and a yield strength above 50,000 psi and the wall has a thickness in the range of .020 to .045 inches. The length of the shaft is typically in the range of 45 to 58 inches. Most preferably, the titanium or titanium alloy has an elastic modulus of over 15 million psi and a yield strength above 70,000 psi and the wall has a thickness in the range of .025 to .035 inches. The hollow tube is substantially rectangular in cross section and has a stiffness requiring a force of 70 to 120 pounds applied at the midpoint to bend the wall to a 1-inch deflection at the midpoint. Typically, the shaft weighs in the range from 250 to 450 grams and preferably from 280 to 400 grams. The shaft wall may be tapered or stepped to provide different thicknesses along the shaft, most commonly being thinner adjacent the lower end where the blade is inserted into the hollow tube. Applicants' player hockey stick shaft makes for a hockey stick which is dynamically responsive, has improved energy transfer, is highly impact resistant and has an overall strength so that the stick is durable while maintaining a low weight which is comparable to the all-composite shafts known in the art.

Applicants' shaft provides these various characteristics whether or not composite materials or other materials are used in conjunction therewith.

The Examiner rejected claim 23 under 35 USC 112, second paragraph, as being indefinite, and in particular claiming a step portion and depending from claim 22 which claims a tapered portion. In accordance with the Examiner's comments, claim 23 has been amended to depend from claim 21 and Applicants submit that said amendment overcomes the Examiner's rejection.

The Examiner rejected claim 1, 26 and 29 under 35 USC 102(b) as being anticipated by Sutherland (US Patent Application Publication 2001/0046910).

In establishing a prima facie case of anticipation under 35 USC § 102, the Examiner must find every element of the applicant's claim in a single reference. Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 2 USPQ2d 1051 (Fed. Cir. 1987). Other references may be used only to interpret the allegedly anticipated reference. Studiengesellschaft Kohle, m.b.H. v. Dart Industries, Inc., 726 F.2d 724, 220 USPQ 841 (Fed. Cir. 1984). This idea was similarly upheld in Scripps Clinic & Research Foundation v. Genentech, Inc., 927 F. 2d. 1565, 18 USPQ2d. 1896 (Fed. Cir. 1991), wherein the Court held that, "Invalidity for anticipation requires that all of the elements and limitations of the claims are found within a single prior art reference."

Applicants have canceled claims 26 and 29. Claim 1 has been amended to indicate that the titanium or titanium alloy has an elastic modulus greater than 13 million psi and a yield strength above 50,000 psi and that the wall has a thickness in the range of .020 to .045 inches. Sutherland teaches a baseball bat having a core which may be a hollow metal tube wherein the metal may be aluminum or titanium. Sutherland teaches at paragraph 70 that the wall thickness of the tubular metal core 37 will vary from between .065 inches and .110 inches in the striking portion 13 and from between .080 and .085 inches in the handle 12 depending on the use of the baseball bat. Sutherland also teaches that the invention is applicable to a hockey stick shaft, as noted in paragraph 56. However, no specific details are given with regard to the hockey stick with regard to thickness of the walls or with

regard to the elastic modulus or yield strength of the titanium or titanium alloy from which the metal tube is made. Thus, Sutherland fails to teach the limitations of claim 1 as amended. Sutherland fails to teach (1) that the titanium or alloy has an elastic modulus greater than 13 million psi and (2) a yield strength above 50,000 psi and (3) that the wall has a thickness in the range of .020 to .045 inches. Inasmuch as claim 1 has been amended to incorporate the limitations of claims 2-4, which were rejected as being obvious in light of Sutherland, Applicants submit that the following argument regarding the obvious rejection applies also to claim 1. Thus, Applicants submit that claim 1 as amended is neither anticipated by or obvious in light of Sutherland, and that claim 1 as amended is therefore is allowable.

<u>In as much as Applicants' invention includes a player hockey stick shaft made of a hollow tube formed of titanium or titanium alloy having an elastic modulus greater than 13 million psi and a yield strength above 50,000 psi and wherein the wall thickness is in the range of .020 to .045 inches, Applicants submit that the present invention is patentably distinct from Sutherland and other cited references.</u>

The Examiner also rejected claims 2-20, 24, 25, 27 and 28 under 35 USC 103(a) as being unpatentable over Sutherland.

The Examiner initially has the burden of factually supporting a *prima facie* conclusion of obviousness, which then shifts the burden of providing evidence for arguments to the Applicant who may submit additional evidence of non-obviousness in order to overcome the Examiner's rejection. MPEP 2142. To establish a *prima facie* case of obviousness, three basic criteria must be met. MPEP 2143. First, there must be some suggestion or motivation to combine the references, the three possible sources of which are the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. MPEP 2143.01, citing <u>In re Rouffet</u>, 149 F.3d 1350, 1357, 47 USPQ 2d 1453, 1457-58 (Fed. Cir. 1998). Second, there must be a reasonable expectation of success in combining the references in order for it to be proper to combine them. MPEP 2143.02, citing <u>In re Merck & Co., Inc.</u>, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir.

1986). Third, all the claim limitations must be taught or suggested by the prior art. MPEP 2143.03, citing In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

The rationale to modify or combine prior art references may be expressly or impliedly contained in the prior art or it may be reasoned from knowledge generally available to one of the ordinary skill in the art, established scientific principles, or legal precedent established by prior case law. MPEP 2144, citing, for example In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). The strongest rationale for combining references is a recognition, expressly or impliedly in the prior art or drawn from a convincing line of reasoning based on established scientific principles or legal precedence that some advantage or expected beneficial result would have been produced by their combination. MPEP 2144, citing In re Sernaker, 702 F.2d 989, 994-95, 217 USPQ 1, 5-6 (Fed. Cir. 1983).

Claims 2-4, 9-10, 14-16, 24, 25, 27 and 28 have been canceled. As noted above with regard to claim 1, the limitations of claims 2-4 have been incorporated into claim 1 whereby the following arguments apply to claim 1. Claims 5-7, 11 and 12 have been amended to change the dependency of the claims in accordance with the amendment of claim 1 and cancellation of claims 2-4 and 9-10.

Sutherland teaches a game device handle or tool handle having a lightweight core which is overwrapped with a composite material wherein the core may be a lightweight wood, metal, or foam. Sutherland focuses primarily on such handles with regard to a baseball bat although amongst other things, the invention may be applied to a hockey stick shaft as well, as illustrated in Fig. 3 and discussed briefly in paragraph 56. Sutherland makes it clear that the primary aspect of the invention is the use of a polymer composite braid or sleeve which overwraps and bonds to a relatively lightweight core whereby the sleeve provides a substantially stronger and stiffer device which is also lighter than standard baseball bats or other handles discussed. The sleeve includes a braid of fibers which are typically fiberglass, graphite, aramid or another similar material. Paragraph 27 of Sutherland also notes that all embodiments of the invention provide a "structural sandwich" comprising a singular thin high strength, high stiffness external polymer composite sleeve or skin

covering which is rigidly bonded with a highly adhesive resin directly to a singular relatively thick, relatively weak lightweight wood, metal or foam core, wherein the polymer composite sleeve includes fibers impregnated with resin. As noted in paragraph 39, the use of such a composite sleeve provides improved dampening which reduces vibrations such as experienced on the contact of a baseball with a baseball bat.

As previously noted, the invention is applicable to a hockey stick shaft, as noted in paragraph 56. However, no specific details are given with regard to the hockey stick beyond the indication that the composite wrap may be placed in the handle portion for dampening and gripping purposes or may be applied to cover the full length of the hockey stick to include the blade. As noted in paragraph 54, titanium or aluminum tubes may be used as the core over which the composite material is wrapped.

A second preferred embodiment is shown in Figs. 4A and 4B and discussed beginning at paragraph 68 with regard to a baseball bat utilizing a tubular metal core 37 which is overwrapped by a composite sleeve or skin 14. With regard to this embodiment of the baseball bat and as previously noted, Sutherland teaches at paragraph 70 that the wall thickness of the tubular metal core 37 will vary from between .065 inches and .110 inches in the striking portion 13 and from between .080 and .085 inches in the handle 12 depending on the use of the baseball bat. Paragraph 71 of Sutherland teaches that the thickness of the composite sleeve 14 is on the order of .040 inches. Sutherland also teaches in paragraph 72 that the durability of the second embodiment is markedly improved over traditional wood or aluminum bats particularly with regard to breakage and surface depressions or dents. Importantly, however, Sutherland also teaches specifically in paragraph 72 that the improved durability is due to the strength of the polymer composite skin and to the particular arrangement of fibers within the skin, which are preferably at an angle of more or less +/-45 degrees to the longitudinal axis of the core.

In short, the basic concept of Sutherland is to provide the thin sleeve 14 made of a polymer composite braid in order to strengthen the core which on its own

does not have the strength or other characteristics necessary to serve alone as, for instance, a baseball bat or hockey stick shaft. This concept allows for the use of a lighter weight core which is relatively weak compared to the material that is typically used to provide on its own the overall characteristics of the entire apparatus, such as a baseball bat or hockey stick shaft. With regard to the hollow metal bat, this allows such a bat to have a reduced weight due to the replacement of a portion of the thickness of the metal wall with the composite sleeve.

In contrast with the Sutherland invention, Applicants' hockey stick shaft is formed of a titanium or titanium alloy hollow tube having a wall thickness, elastic modulus and yield strength falling within a specific window. It is the titanium structure itself falling within this particular window that provides the structural integrity and other characteristics of the shaft such as the durability, suitable stiffness or flexibility range, a high energy transfer to the puck and excellent dynamic response within a lightweight structure comparable to all-composite hockey stick shafts.

Thus, whether or not any material is wrapped around the hollow titanium tube of the present invention, the key aspect of the invention is that all the desirable qualities noted above are provided by the titanium or titanium alloy shaft itself, and as reflected in the claims and Specification, that a successful titanium shaft falls within a narrowly defined window. The specific characteristics needed to provide the titanium hockey stick shaft of Applicants' invention are simply not taught or suggested by Sutherland, which at best discusses the wall thickness needed for the hollow core of a baseball bat, with no mention of such a thickness with regard to the hockey stick shaft. As previously discussed, the wall thickness that Sutherland teaches with regard to the core of the baseball bat shown in Figs. 4A and 4B is completely outside the range claimed and taught by the Applicants and indeed would make the hockey stick of the present invention far too heavy to be desirable for its purpose.

Applicants have shown that the substantially thinner-walled titanium tube is capable of withstanding the rigors of sustained hockey play and that this

characteristic is due solely to the titanium or titanium alloy itself. In addition to this, no vibration or harmonic problems were found with Applicants' titanium hockey stick shaft during the hitting of the puck, as noted on page 26 of the present Specification in lines 11-15. As previously noted, paragraph 39 of Sutherland indicates that the formation of the thin sleeve or skin 14 is responsible for offering improved dampening which reduces vibrations related to contact between a baseball and a baseball bat. Thus, Sutherland teaches that such vibration dampening is related to the use of the sleeve whereas Applicants' shaft substantially or completely eliminates such vibration problems without the need for additional structure other than the titanium tube itself.

Indeed, all the positive characteristics of the Sutherland apparatus are tied directly to the use of the composite material sleeve. Thus, Sutherland fails to teach or suggest a hollow titanium shaft as claimed which on its own achieves the highly desirable characteristics as discussed above. Indeed, Sutherland teaches away from such a hockey stick shaft for the very reason that the Sutherland structure must use the composite sleeve in order to achieve the various advantages taught by Sutherland.

Further, the shaft of the present invention gave rise to several unexpectedly beneficial results. For instance, as noted at page 25 of the Specification, lines 21-23, the survivability of the shafts during actual play was unexpected given such thin walls. In addition, as noted at page 25 of the Specification, lines 20-21, the shafts remained full functional even after experiencing fairly substantial denting during play. The above unexpected results are supported by the Affadavit of Inventor Schutz attached hereto. Further, as noted on page 26 of the Specification, lines 11-15, the fact that there were no harmonic vibration problems was an unexpectedly good result due to the fact that low dampening capacity of metals normally creates undesirable vibrations with regard to contact with a puck etc. This latter unexpectedly beneficial result is further supported by the Affidavits of Inventors Schutz and Miller attached hereto. In addition, as supported by the Affidavit of

Inventor Schutz, others have tried to create a titanium hollow tube player stick hockey shaft but have failed.

Applicants reemphasize that the above discussion applies to claim 1 as having been amended to incorporate rejected claims 2-4 as being obvious over Sutherland. In light of the above discussion, Applicants submit that claim 1 is not obvious in light of Sutherland and is therefore allowable, and that claims 5-8, 11-13 and 17-20 are allowable as depending from allowable claim 1.

<u>Inasmuch as Applicants' invention includes a player hockey stick shaft made of a hollow tube formed of titanium or titanium alloy falling within the narrow window as defined by the recited elastic modulus, yield strength and wall thickness whereby the characteristics of the shaft – such as durability resulting from a high strength and impact resistance, appropriate stiffness/flexure, high energy transfer to the puck, dynamic response and low weight -- are embodied by the titanium or titanium alloy tube itself; and wherein the shaft yielded unexpectedly good results including (1) survivability of the shafts during actual play despite having such thin walls, (2) survivability and full functionality of the shafts even after experiencing fairly substantial denting during play and (3) lack of harmonic vibration problems which would have been expected upon contact between the hockey stick and a puck; Applicants submit that the present invention is patentably distinct from Sutherland and other cited references.</u>

The Examiner also rejected claims 21 and 23 under 35 USC 103(a) as being unpatentable over Sutherland in view of Kunisaki et al. (US patent 6,117,029). In light of the amendment to claim 1 and argument with regard thereto, Applicants submit that claims 21 and 23 are allowable as depending from allowable claim 1. As previously noted, claim 23 has been amended to overcome the Examiner's rejection under 35 USC 112, second paragraph.

The Examiner also rejected claim 22 under 35 USC 103(a) as being unpatentable over Sutherland in view of Merola (US patent 3,479,030). In light of the amendment to claim 1 and argument with regard thereto, Applicants submit that claim 22 is allowable as depending from allowable claim 1.

In addition, Applicants have added new dependent claims 30-43, which Applicants submit are allowable as depending from allowable claim 1 and in their own right. Claim 43 indicates that the shaft is free of fiber-reinforced composite material bonded to the outer surface of the hollow tube. This specifically further defines over Sutherland, which as discussed above, depends on the use of such a composite material.

In light of the above discussion, Applicants therefore submit that claims 1, 5-8, 11-13, 17-23 and 30-43 are allowable over the cited references.

In view of the foregoing, the Applicants respectfully request reconsideration of the claims and most earnestly solicits the issuance of a formal notice of allowability for the claims. Please call the undersigned attorney if any questions remain after this amendment.

Respectfully submitted at Canton, Ohio this 17th day of January, 2005.

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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Ronald W. Schutz, et al.

Serial No: 10/813,141

Examiner: Graham, Mark

Filed: 3/29/2004

Art Unit: 3711

Confirmation No.: 5414

For: TITANIUM HOCKEY STICK

Docket: 1772019US1AP

Commissioner for Patents
P.O. Box 1450
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AFFIDAVIT

I, the undersigned, have a fairly lengthy experience in the field of ice hockey. More particularly, I am a high school ice hockey coach, having coached for twelve (12) years and having played hockey for twenty (20) years. For approximately ten (10) of those years, I used hockey sticks having aluminum tubular shafts. In order to be reasonably durable, aluminum shaft hockey sticks were generally on the heavy side, making them more difficult to maneuver. However, aluminum shafts having thinner walls to make them lighter created fatigue problems as well as harmonic vibration issues. In particular, the fatigue problems included bowing of the shaft in one direction after a certain amount of play, which required that the hockey stick blade be removed and turned around within the hosel of the shaft in order to cause the shaft to bow back the other direction to keep the shaft reasonably straight for continued use. In addition, these thinner wall aluminum shafts experienced failure due to cracking in the corners of the hosel area such that these aluminum shafts sometimes lasted only a few months.

Moreover, the vibration or harmonic issues noted above were very noticeable in the lighter weight aluminum shafts. As is known from various sports including baseball, golf and hockey, harmonic vibrations caused when hitting a ball or puck can be a substantial nuisance and at times, rather painful. These harmonic vibrations are exacerbated in colder temperatures, which is an inherent aspect of ice hockey play. As a general rule, the lighter the stick is with respect to the object that the stick is hitting, the greater the incidence of harmonic vibrations.

Based on this background, during the process of inventing the titanium hockey stick shaft of the above-referenced patent application, I became highly suspicious about being able to produce a titanium shaft which would meet the lighter weight requirements necessary to make the hockey stick attractive from a weight standpoint while also resulting in a shaft being substantially free of or having minimal harmonic vibration problems. Fortunately, and to my great surprise, I was wrong. As it turns out, the lightest weight titanium shafts we have developed which withstand our durability testing are also free of harmonic vibration problems. I have found this to be true based on my own experience with our titanium shaft hockey sticks during my own play. In addition, various other players, including those who tested our prototype titanium hockey stick shafts, also reported that these hockey sticks are free of harmonic vibrations during play.

12/10/04
Date

Alan L. Miller

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Ronald W. Schutz, et al.

Serial No: 10/813,141

Examiner: Graham, Mark

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AFFIDAVIT

I, the undersigned, am a metallurgist by trade and work in research and development with regard to materials engineering. In addition, I have played ice hockey essentially all my life, including some time spent as a youth ice hockey coach. Thus, during roughly 40 years of playing ice hockey, I have used all types of hockey sticks, including those having shafts made respectively of wood, aluminum and all-composite materials. As discussed in the present patent application, each of these types of shafts have their own problems. All-composite shafts are rather susceptible to breakage and therefore ultimately provide a rather costly option. Aluminum shafts, which have essentially been removed from the market, either provided a shaft that was on the heavy side or, when the walls were thin enough to be sufficiently light, that led to cracks in the hosel area and bowing of the shaft. In order to produce an ice hockey stick shaft which was lightweight and still maintained the proper characteristics of stiffness, flexure and strength, I had hoped that the use of a titanium or titanium alloy tube would provide these various

characteristics despite the fact that I was aware of two companies that had already tried and failed to form a suitably functional titanium tubular shaft. The information I received concerning those failed attempts was that the shafts either buckled and collapsed, were susceptible to bowing or were overly flexible ("whippy").

During the development of the titanium tubular shaft of the present invention, the relatively narrow window of desirable weight required that the walls of the shaft be so thin that the elastic modulus had to be increased in order to maintain sufficient shaft stiffness, which was surprising inasmuch as it would normally be expected that a metal shaft would normally be stiff enough. It was also necessary to simultaneously increase the minimum yield strength of the titanium in order to avoid permanent deformation (ie. bowing) incurred from hard slap shots. With walls this thin, I was surprised at the survivability and overall durability of these titanium tubular shafts. The walls had simply become so thin that prior to testing I questioned the ability of the shafts to survive the rigors of actual play. However, as documented in the present application, a relatively narrow window of titanium shafts were able to survive while maintaining a sufficiently low weight and responsive dynamics due to a proper stiffness or flexure of the shaft. Along the lines of survivability, it was also unexpected that many of the shafts experienced shallow denting and even fairly substantial denting during play while remaining fully functional. In addition to the results reported in the patent application, I myself and five other men have been using ice hockey sticks with our titanium shaft for more than a year on a fairly regular basis, and have found that the survivability and durability characteristics of these sticks substantially exceeded those of wood or composite as supported by our personal experience during this period.

Therefore, there exists a relatively narrow, unique window (range) of titanium shaft wall thicknesses and material property values (modulus and strength) which must be coincidentally met to achieve a viable light-weight, responsive, and durable titanium hockey stick shaft.

Another unexpected result with these titanium shafts was the lack of harmonic vibrations upon contact of the hockey stick with a puck. Due to the low

dampening capacity of metals generally, I had expected to experience such harmonic vibrations, especially with shafts having walls thin enough to meet the weight window while also maintaining the other characteristics of a suitable shaft. The players who originally tested our hockey sticks reported that these titanium shafts were free of or had minimal vibration issues during play. In additlon, those of us who have continued to play with the sticks up to the present time have all noted that the lack of harmonic vibration problems has held true during the life of the sticks thus far.

1/11/05
Date

Ronald W. Schutz
Ronald W. Schutz